LITTORAL COMBAT
FUTURE NAVAL CAPABILITY

PROGRAM OVERVIEW

April 2003

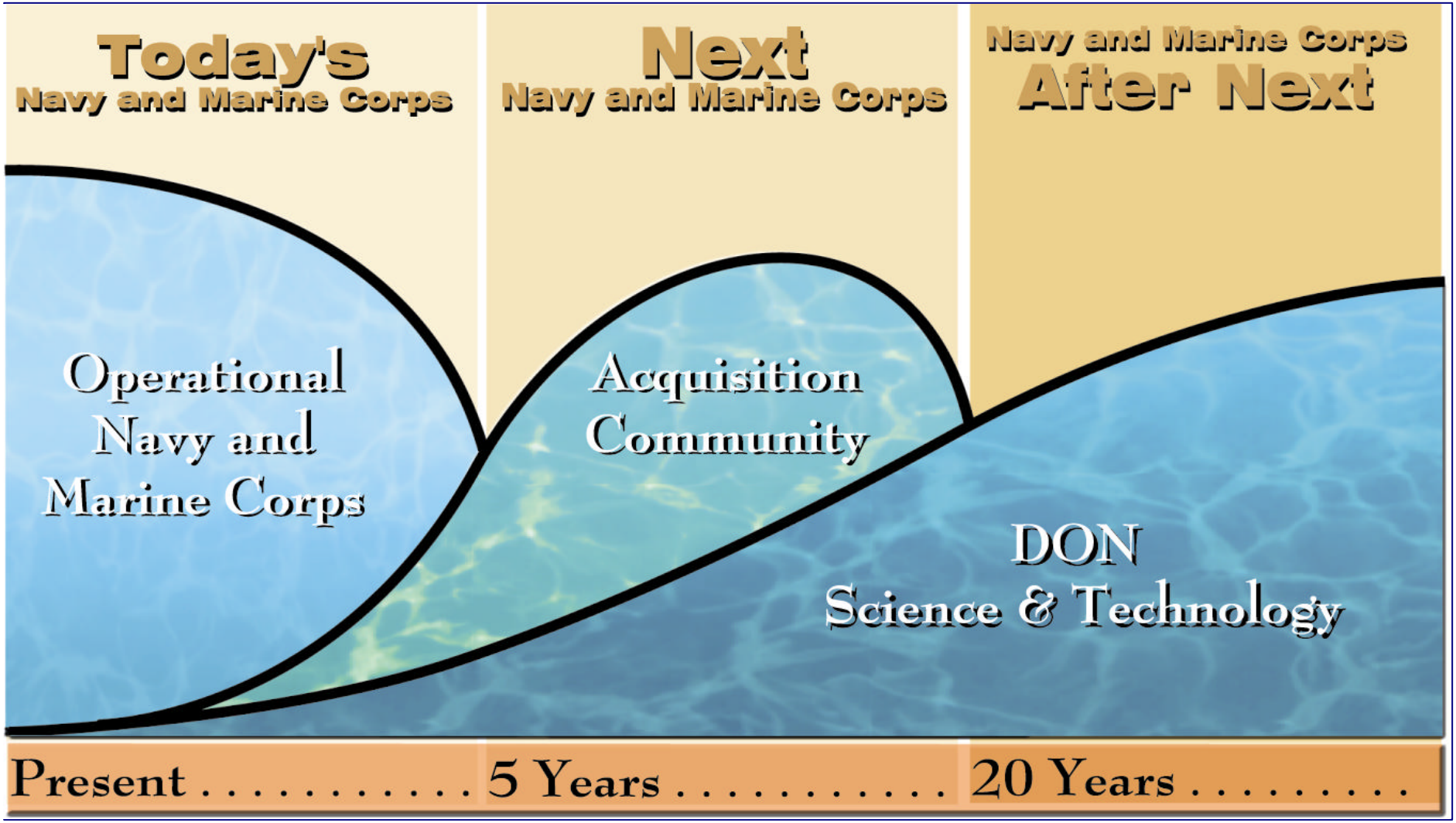
Take Aways

- FNC programs are designed to support the "warfighter" of the future
- Littoral Combat FNC is a "new" FNC
  - FY02 Start
  - No previous program to build on
- LC FNC is inherently Naval
- War gamming and analysis help define program
- LC FNC is only "one leg" of the USMC's S&T Triad

ONR Mission

To provide the scientific and technological base that maintains and expands the technological superiority of the Navy and Marine Corps forces at reduced cost.

Concepts:Toward the Naval Services-After Next



USMC Science & Technology Triad

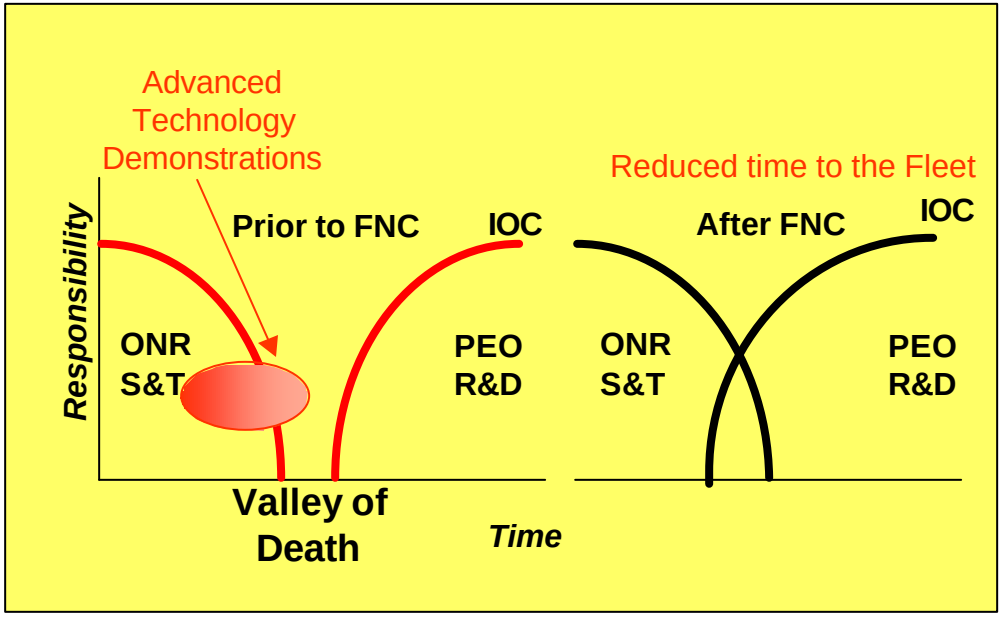
- **ONR 353 – Discovery and Invention**
- **Littoral Combat Future Naval Capability – Technology Development and Transition**
- **Marine Corps Warfighting Lab - Experimentation**

Future Naval Capabilities

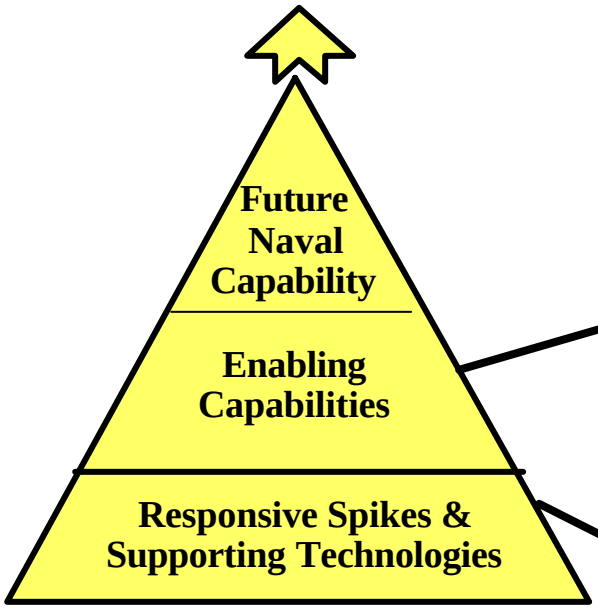
- **What are Future Naval Capabilities (FNCs)?**
  - **A process to align and partner the Requirements, Acquisition and S&T communities to focus S&T investments to deliver and transition priority Naval capabilities within the FYDP**
- **Why have them?**
  - **To get new products/technology in the hands of the warfighter sooner**

Bridging the S&T Valley of Death

- Naval S&T is actively engaged to enable the rapid transition of mature technologies to product developers.
- Future Naval Capabilities solve the existing S&T acquisition "Valley of Death" by partnering with Acquisition Managers.
- Future Naval Capabilities focus S&T funding on transitionable products.



FNC "Taxonomy"



Approved by the FNC's IPT

1 Enabling Capability #1
2 Enabling Capability #2
3 Enabling Capability #3
• • •
n Enabling Capability #n

1 Supporting Technology #1
2 Supporting Technology #2
3 Supporting Technology #3
• • •
n Supporting Technology #n

Role of FNC IPT

- **IPT identifies, defines, and prioritizes Enabling Capabilities**
- **Examines Enabling Capabilities to identify the gaps necessary to achieve the FNC**
- **IPT develop "specifications" to defined required capabilities**
- **IPT operates on a <u>consensus basis</u>**

FNC Project/Technology Selection Criteria

- The degree to which it closes a defined capability gap and the warfighting priority of closing that gap
- The ability to deliver the product and demo it within the FNC window of time
- The commitment to transition
- The affordability (cost and opportunity cost) of the project in a capped FNC budget

Future Naval Capabilities

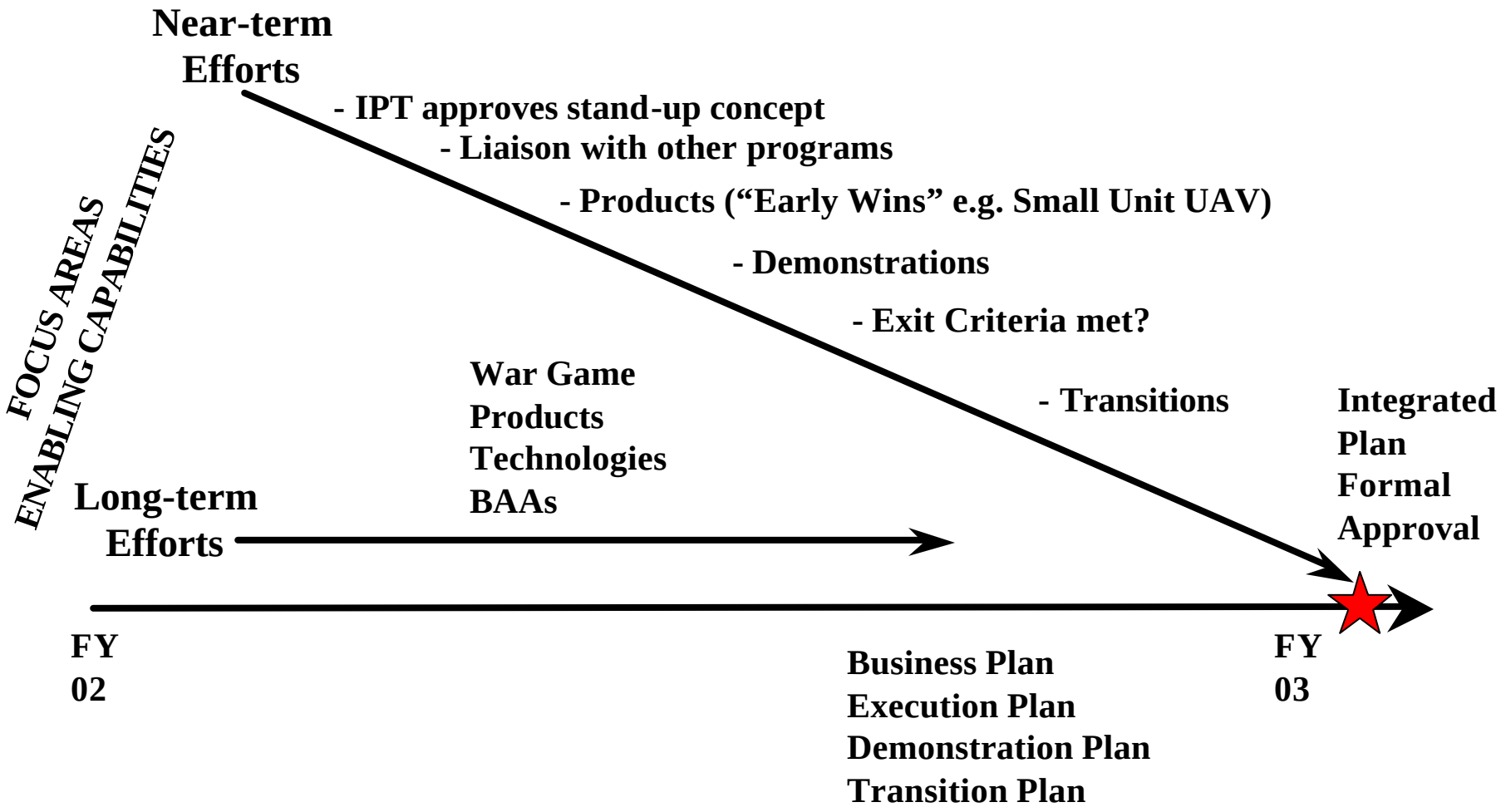
- Organic Mine Countermeasures
- Knowledge Superiority and Assurance
- Time Critical Strike
- Autonomous Operations
- Littoral Antisubmarine Warfare
- Total Ownership Cost Reduction
- Missile Defense
- Platform Protection
- Warfighter Protection
- Capable Manpower
- *Littoral Combat*
- Expeditionary Logistics
- Electric Ships and Combat Vehicles

Littoral Combat FNC

IPT Members

- **Requirements** — MGen James Battaglini, N75; BGen Kenneth Glueck, MCCDC
- **Acquisition** — BGen William Catto, MCSC
- **S&T Manager** — Mr. Tom O'Leary, ONR 353
- **Resources** — BGen Jay Paxton, USMC HQ (P&R)

LC FNC Stand-Up
Dual Track Process



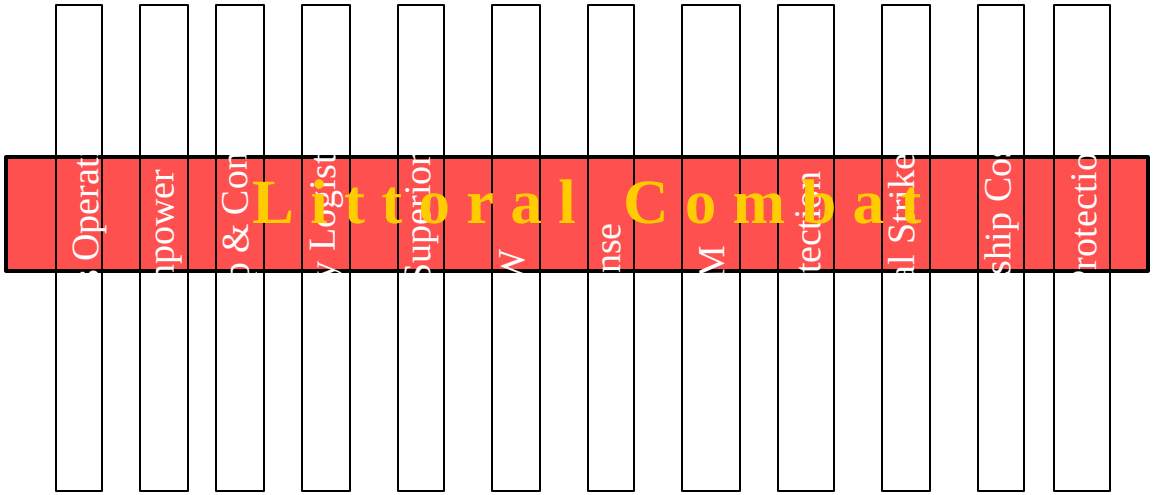
LC FNC Goal and EC's

- **Goal:** ***Support the development of Naval Expeditionary Maneuver Warfare via the application of technologies which enhance the ability of the Navy-Marine Corps team to achieve assured access and sustained operations in the littorals as the naval portion of a joint campaign.***

  - **EC #1 - Expeditionary ISR for the Amphibious Force (AF)**
  - **EC #2 –Expeditionary Fires Support for the MAGTF**
  - **EC #3 –MAGTF Maneuver in the Littorals**
  - **EC #4 –Expeditionary Task Force Command & Control in the Littorals**

LC FNC Interfaces

Littoral Combat FNC cuts across other FNCs



Littoral Combat is an expansive warfighting problem set

Littoral Combat is not a "Green" only concern

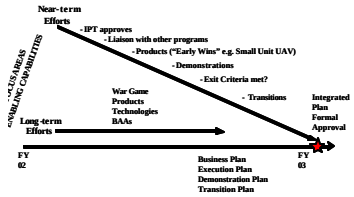
Littoral Combat is a Naval concern - It is where the future fight is

Need to provide technology that will enable Naval Expeditionary Maneuver Warfare

LC Program Generation

FNC Goal

Enabling Capabilities

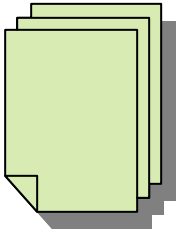


Near-Term Products

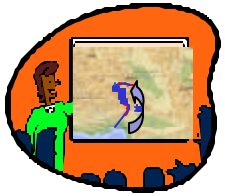
EMW War Game

Technologists Panel

Industry Solicitation



White Papers



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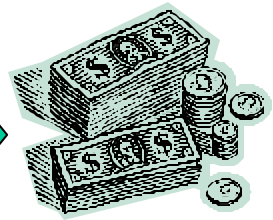

Investment Strategy

Evolution of EMW Game Shortfalls

Original Shortfalls From Game:
- OTH/BLOS Tactical Communications Relay
- Information Management/ Decision Support Tools
- Data Flow Optimization
- Dynamic Execution from all Assault Platforms
- Personal ISR package
- Locally Controlled UAVs
- Dynamic Navigation
- Network Architecture
- Assured Access
- Landmines and Obstacle Breaching
- ISR supporting Precision Maneuver
- Robust and capable C2 systems
- Adaptive Mission Planning
- Vertical Assault Force Survivability
- Decontamination
- Force Protection Afloat and Ashore
- ITV
- Target Location and Engagement
- Netted Fires
- Ashore Counterbattery
- Reduce the "Cost" of Fires
- Responsive Targeting and Taskable Firing System
- Modular Lightweight Mobile Weapon Systems

Consolidated List From Report:
- STOM C2
- OTH/BLOS Tactical Communications Relay
- IM/Decision Support Tools
- Data Flow Optimization
- Remote Unmanned Sensor
- Personal ISR Package/Target Locating Device
- Organic UAV
- Network Architecture/Netted Fires
- Mine Breaching/Clearing
- Force Protection
- Decontamination
- Adaptive Mission Planning System
- ITV
- Ashore Counter-battery
- Reduce "cost" of Fires
- Loitering Munitions
- New Modular, Lightweight Mobile Weapons Systems
- EFSS Enhancements

Recommended List From Technologist Panel:
- STOM C2
- Dynamic Execution from all Assault Platforms
- OTH/BLOS Tac Comm Relay
- IM/Decision Support Tools
  - Adaptive Mission Planning System
  - Network Architecture/Netted Fires
- Data Flow Optimization
- Remote Unmanned Sensor
- Personal ISR Package/Target Locating Device
- Organic UAV
- Mine Breaching/Clearing (coordinate with 353)
- ITV (coordinate with 353)
- Netted Fires

Published in BAA:
- OTH/BLOS Tactical Communications Relay
- Information Management
- Data Flow Optimization
- UAV Sensor Payloads
- Integration of Existing Mapping Capabilities
- Netted Fires

EC 1 ISR

Description. **EC1 will provide enhanced autonomous and semi-autonomous ISR capabilities to elements of a MAGTF. These enhanced ISR capabilities will be locally tasked and controlled. The focus of effort for EC1 is the development of a tactical UAV platform, control station, and sensor packages in order to increase the ISR capabilities of tactical units, Regiment and below**

- **Product Line 1 Tactical Platforms**
  - **Product A Tier II UAV**
- **Product Line 1 Tactical Sensors**
  - **Product A Tactical Hydrographic Survey Equipment**
  - **Product B EW Payload**
  - **Product C Digital EO/IR Payload and Processing**
  - **Product D Chem/Bio Sensor Package**

EC 2 Fires

Description. **EC2 will provide enhanced fires support to elements of a MAGTF operating ashore. The intent of EC2 is to develop an expeditionary fire support system with improved ammunition as well as the integration of all legacy and future fires systems into a netted Naval Fires Network. The expeditionary fire support system will be helicopter-transportable. The focus of effort for EC2 is on expeditionary fires at the element level of the MAGTF.**

- **Product Line 1 Indirect Weapon System Enhancements**
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- **Product Line 3 Improved Ammunition**
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  - **Product B Advanced Ammunition Packaging**
  - **Product D Lethality & Advanced Warhead Study**

EC 3 Maneuver

Description. **EC 3 will provide for enhanced maneuverability of surface- landed elements of the MAGTF. The intent of EC 3 is to provide knowledge-based situational awareness to assault forces embarked in maneuver platforms. This enhanced situational awareness will allow assault forces to dynamically plan and adaptively execute in the conduct of STOM operations. Moreover, improved mine and obstacle breaching capability from the beach exit zone to the objective will enhance maneuverability of surface-landed assault forces. The focus of effort for EC 3 is on enhanced surface-maneuver for elements of the MAGTF.**

- **Product Line 1 Knowledge-based Situational Awareness**
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  - **Product C EX45 Stable Gun Mount**
- **Product Line 3 Land Mine Countermeasures and Breaching**
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EC 4 Command and Control

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  - **Product C Rapid Terrain Database Generation**
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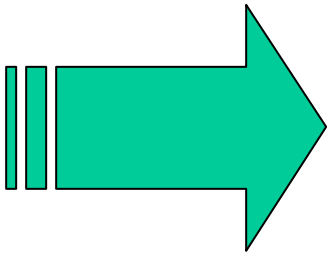
LC FNC Products

FY03-07

PRODUCTS
ISR
Sensors
Platforms
FIRES
Expeditionary Fires
Netted Fires
Improved Munitions
Light Fire Control
Advanced Materials
MANEUVER
Planning & Execution
AAAV Obstacle Avoidance
Countering Mines & Obstacles
COMMAND & CONTROL
Data Flow Optimization
Situational Awareness
BLOS Connectivity



All feed to key technology gaps/enhancements to POR's to realize Naval Transformation

Summary

- **Littoral Combat FNC focus is Expeditionary Maneuver Warfare in support of Naval Transformation**
- **Each effort has an operational string**
- **Building broad partnerships with Navy Marine Corps Team as well as other Services**

Back Up Slides

(Representative Examples of LC FNC Products/Technologies)

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Tier II UAV

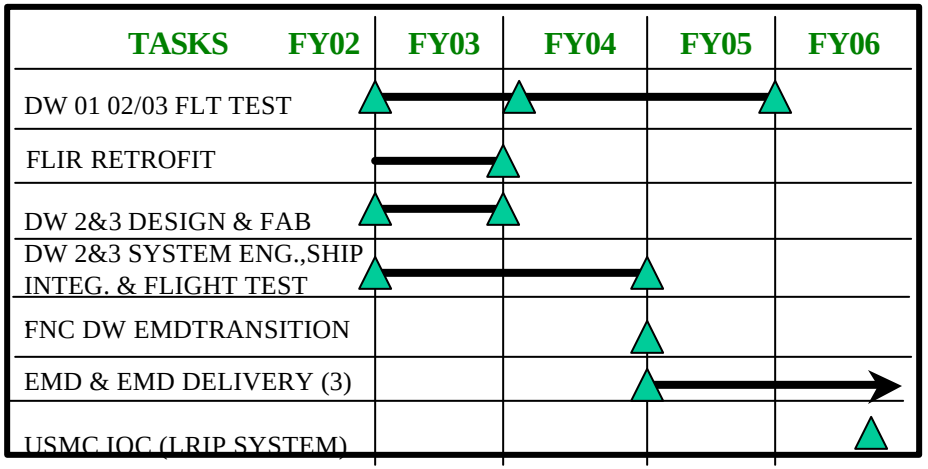
OBJECTIVE:
- **LOW COST FULL AUTONOMOUS AIR VEHICLE**
- **SINGLE HMMWV TRANSPORTABLE**
- **VERTICAL TAKE OFF & LANDING**
- **RECON, SURVEILLANCE & TARGETING AND WIDE BAND COMM RELAY**
- **REGIMENTAL/MEU ASSET**
- **GROUND & SHIPBOARD OPERATION**

PAYOFF
- **TECHNOLOGY DEMO ON A SYSTEMS BASIS**
- **EARLY SYSTEMS ENGINEERING**
- **STRONG INDUSTRY TRANSFER CAPABILITY**

TECHNICAL APPROACH:
- **SUPPORT THE USMC CR UAV ORD**
- **COMPOSITE AIRFRAME & DYNAMIC COMPONENTS**
- **ADVANCED HEAVY FUEL ENGINE**
- **DOD TCS SOFTWARE COMPATABILITY**
- **ACTIVE C4I COMPONENTS**
- **OPEN ARCHITECTURE**

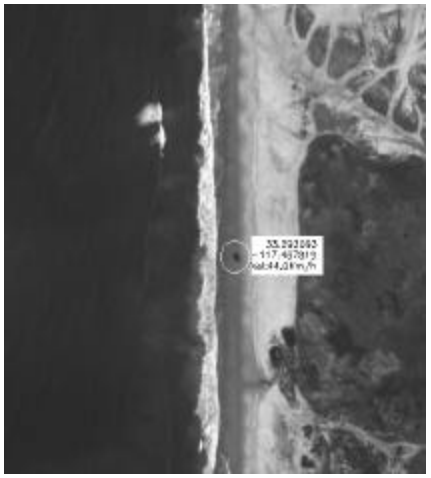
PERFORMERS: MCWL, NRL, MCSC, NAVAIR, PEO(W) (PMA-263)

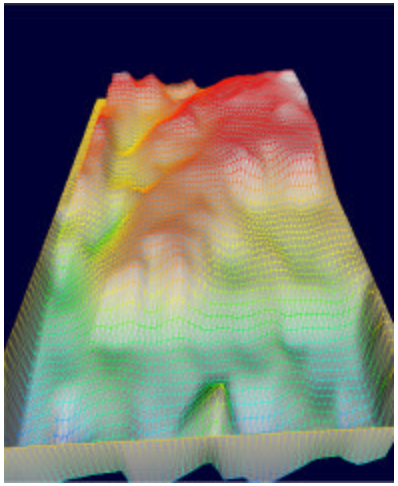
SCHEDULE:



TRANSITION: MARCORSYSCOM/PEO(W)

DIGITAL EO/IR PAYLOAD & IMAGE PROCESSING





OBJECTIVE:

- **DIGITAL EO/IR IMAGES**
- **OBJECT DETECTION & LOCATION**
- **WAVES AND CURRENT PROFILES**
- **OBJECTS AND PROFILE GEO MAP REGISTRATION**

PAYOFF

- **LANDING ZONE & SURF ZONE PROFILE**
- **OBJECTS DETECTED GEO LOCATED ON MAP**
- **OBJECT AND PROFILE MAP FILE INTO CROP**

TECHNICAL APPROACH:

- **DEVELOP & TEST LOCATE & GEO REGISTER SOFTWARE**
- **INTEGRATE SW WITH DIGITAL EO/IR PAYLOAD**
- **CONDUCT HDW-SW INTEGRATION AND DEMOSTRATION TESTS**
- **ASSESS RESULUTION OF EO/IR SYSTEM**
- **TEST REPORT AND RECOMMENDATIONS**

PERFORMERS: ARETE AND NSWC-CSS

SCHEDULE:

TASKS	FY02	FY03	FY04	FY05
EO/IR IMAGE PROCESS PROG				
DEVELOP HDW & SW				
INTEGRATE & TEST				
RESOLUTION ANALYSIS				
RECOMMENDS & REPORT				

TRANSITION: MARCORSYSCOM & NAVAIR

EC 2 Fires

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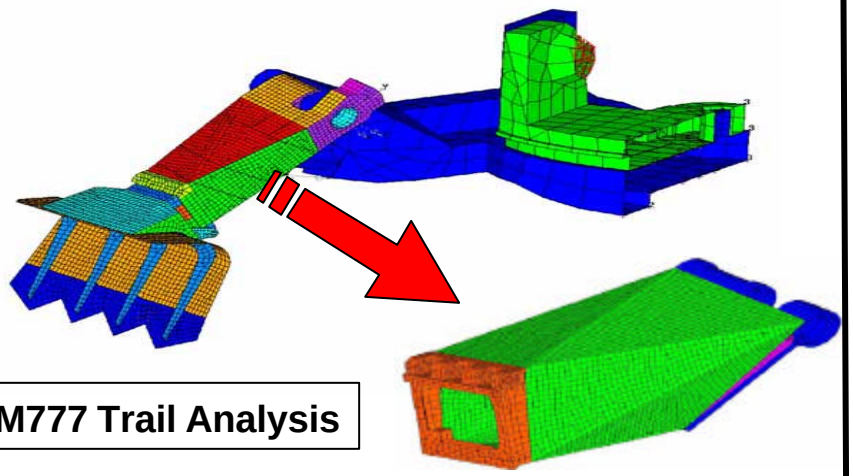
Isogrid Technology/Towed Howitzer Development



M777 Trail Analysis

OBJECTIVE:

- Reduce M777 trail weight and manufacturing cost while maintaining performance
- Demonstrate isogrid technology usefulness for application to any weight critical weapon system

PAYOFF

- Increased range, deployability & mobility without sacrificing lethality and survivability
- Reduced logistics burden.
- Designed in reliability, availability, prognostics and diagnostics.

TECHNICAL APPROACH:

- Test/Verify isogrid modeling and analysis (TestBed II)
- Apply isogrid technology to M777 trails
- Test/Verify modeling and analysis (M777 trails)
- Investigate applicability of isogrid technology to other M777 structural components.

PERFORMERS: ARDEC, General Atomics, JPMLW155

SCHEDULE:

TASKS	FY03	FY04	FY05	FY06
TC2 TESTING	△—			
LW155 TRAIL DESIGN /TEST	△—△			
OTHER LW155 INVESTIGATION	△	—△		
TRANSITION		△		

TRANSITION: JPMLW155

Dismounted Mortar Fire Control System

M120
(US Army)

Weapon Pointing Device

TDA 120RT
(French)

Computer

OBJECTIVE: To develop an Aiming, Pointing, and Fire Control System that integrates advanced technologies with COTS/NDI gun systems to meet the five requirements of accurate predicted fire.

PAYOFF

- Advanced Aiming and Pointing
- Enhanced Gunner Displays
- Enhanced Fire Control Computer
- Integrated Fire Control System w/Gun System

TECHNICAL APPROACH:

- Establish accurate weapon location (grid, altitude, directional control)
- Integrate accurate weapon and ammo information for calculating firing solution
- Obtain and integrate accurate meteorological data
- Integrate with AFATDS and other netted fires systems (accurate target location)
- Provide communications capability via organic radio assets & Secure Mobile Net.
- Modular Software design
- Provide advanced packaging for electronic assemblies/modules to optimize miniaturization, interchangeability, and survivability in gun system environments

Performers: MARCORSYSCOM, ONR, MCWL, PM Mortars

SCHEDULE:

TASKS	FY03	FY04	FY05	FY06
System Design	△			
CDR	△			
Fabricate Prototypes (2)	△			
Final Test Plan	△			
Test S/W	△			
Demo Prototypes	△			
Transition	△			

TRANSITION: MARCORSYSCOM EFSS

EC 3 Maneuver

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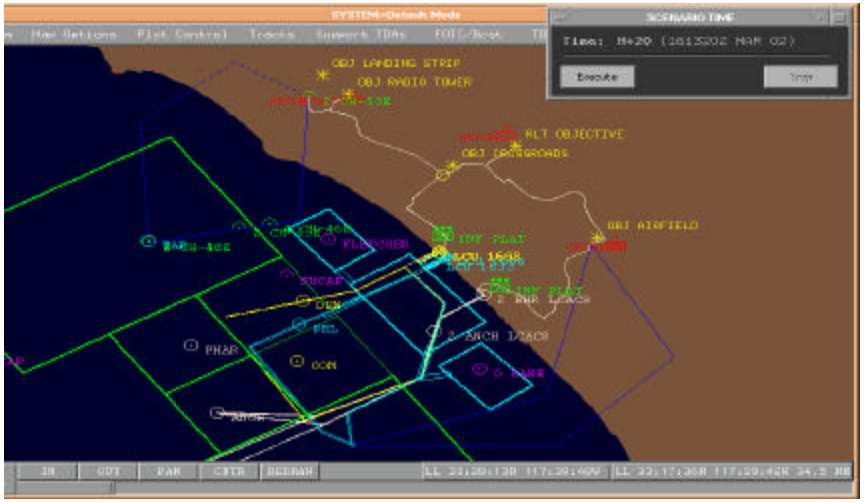
Maneuver Planning & Execution



OBJECTIVE:

Develop, evolve, and demonstrate technology solutions that provide tools for the Commander, Amphibious Task Force (CATF), Commander, Landing Force (CLF), and their staffs that support the conduct of the military decision-making process in the planning, evaluation, and execution of all phases of Expeditionary Warfare, ranging from traditional large-scale amphibious assaults to rubber boat raids by USMC Force Reconnaissance teams.

PAYOFF

- Reduce planning time and increase speed of command to allow rapid decisions, re-planning, and in-stride assault guidance
- Increased probability of success, minimize fratricide and increase deconfliction

TECHNICAL APPROACH:

- Evolutionary software development within DII COE
  - Build-A-Little, Test-A-Little, Field-A-Little (BALTALFAL)
- Integrate video, GPS, and display technology for Augmented Reality display

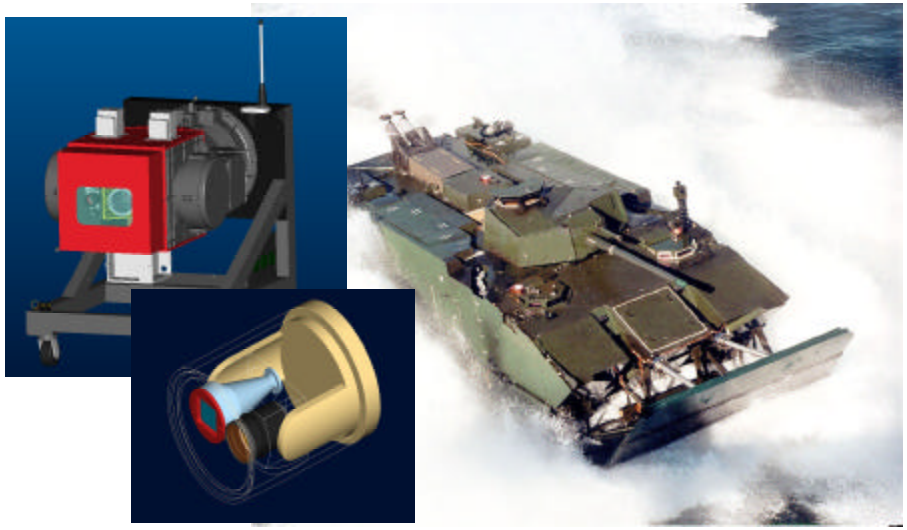
PERFORMERS: SAIC, NRL (DC), APL/UW, TSI, Wagner Associates

SCHEDULE:

TASKS	FY02	FY03	FY04	FY05
ARVCOP				
EDSS (DII COE 3.1)				
EDSS (DII COE 4.x)				
GOVT TESTING/DEMO				
TRANSITION TO NAVSEA				

TRANSITION: NAVSEA, SPAWAR

AAAV Collision Avoidance System



OBJECTIVE:

- Integration and demonstration of a Collision Avoidance System on the AAAV
- Incorporate CAS capability in other maneuver platforms

PAYOFF

- Enhanced maneuverability of surface-landed elements of the MAGTF
- Situational awareness to assault forces embarked in maneuver platforms
- Improved mine and obstacle breaching capability from the line of departure, through the beach exit zone to the objective.

TECHNICAL APPROACH:

- Builds on successful SBIR Phase II
- Technology maturation/technology characterization initiated in SBIR Phase I and II
- Miniaturization and integration of CAS prototype capability
- Demonstration of prototype system in open ocean environment
- Transition of TRL 7-8 to support AAAV LRIP
- Transition of technology will be completed as LC FNC C2 Enabling Capability
- Includes technology evaluation for AAAV P3I
- Includes multiple platform integration initiatives

PERFORMERS: ARETE, General Dynamics

SCHEDULE:

TASKS	FY03	FY04	FY05	FY06
RQMTS ANALYSIS/ TRADE STUDY				
DESIGN/FABRICATION				
SYSTEM INTEGRATION				
DEMONSTRATION				
TRANSITION(S) TO AAAV				

TRANSITION: AAAV, LAV, AAV

EC 4 Command and Control

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- **Product Line 3 Data Flow Optimization**
  - **Product A Network Management Tools**
  - **Product B Decision Support Tools**

Secure Mobile Networks

OBJECTIVE:

- Provide an integrated Type 1secure environment to enable transition to various Navy and Marine Corps Programs.
- Provide technical data and characterization of network performance in tactical environments.
- Provide transition partners with technical design guidance, CONOPs, & Joint TTPs
- Support requisite documentation for insertion of technology into appropriate architectures to ensure rapid fielding to operational forces
- Support the services' development of infrastructure to support Secure Wireless LAN capabilities.

PAYOFF

- CP On-the-Move Connectivity
- Seamless Mobility for Roaming Subscribers (Afloat & Ashore)
- DoD Secure Wireless Design Guidelines
- Decreased Network Setup Time/Reduced Logistics Footprint

TECHNICAL APPROACH:

- Integration effort designed to meet POR requirements
- Close coordination with transition partner PORs
- Integration conducted in MCTSSA SIE & USS CORONADO
- SWLAN Facility selected as DoD secure wireless LAN Beta Test Site.
- Joint Wireless Working Group & DoD Wireless Policy Working Group
- Transition initiatives commenced during ELB ACTD Demonstration Phase. Transition of technology will be completed as LC FNC C2 Enabling Capability

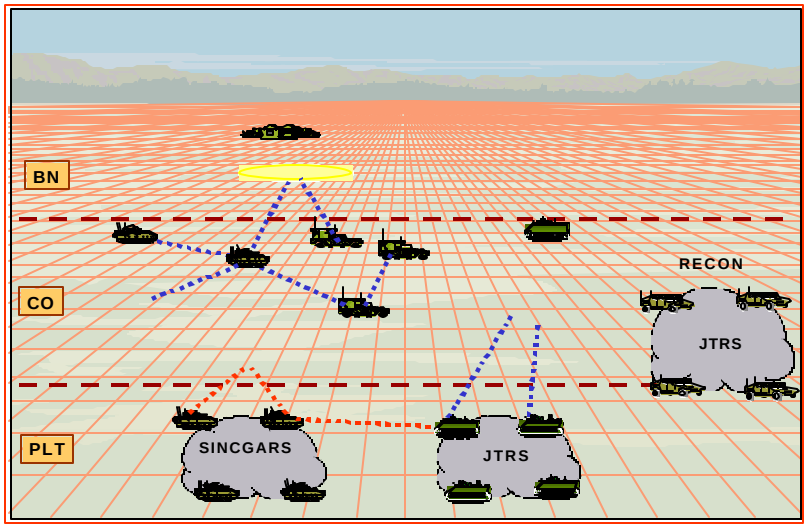
PERFORMERS: MCTSSA, Potomac Institute, CENGEN, Noesis, Harris, BAH, OSEC, Darlington

OVERALL SCHEDULE:

TASKS	FY02	FY03	FY04	FY05
SECURE WIRELESS COMPONENT TO 73TH REG				
HARRIS BETA TEST SITE				
BASIC INTEGRATION				
FEASIBILITY ASSESSMENT				
FIELDING COMPONENT				
TRANSITION(S) TO PMs				

TRANSITION: MARCORSYSCOM, SPAWARSYSCOM

BLOS Innovative Relays



OBJECTIVE:

- Develop capability to provide secure voice and data communications during ship-to-shore movement and to the tactical war-fighter over distances of 200 nautical miles

PAYOFF

- Provides communication connectivity necessary to support STOM operations
- Provides ability to dramatically extend range of both legacy and future JTRS networks

TECHNICAL APPROACH:

- Define operational and system performance requirements to support simultaneous EPLRS, SINCGARS, and JTRS WNW relay functions
- Conduct engineering analyses and supporting modeling and simulation activities
- Develop system prototypes suitable for integration into potential USMC TUAV's
- Evaluate in a controlled environment to document technical performance metrics
- Perform field assessment in a representative tactical environment.
- Establish roadmap for transition to acquisition

PERFORMERS: Contractors TBD (L3 Comm, NG)

SCHEDULE:

TASKS	FY03	FY04	FY05	FY06
AWARD CONTRACT	△			
SYSTEM DESIGN & DEV	△	△		
INTEGRATION & TEST		△	△	
CONCEPT OF OPERATIONS	△	△		
SYSTEM DEMONSTRATION			△	△
TRANSITION TO ACQ PM				△

TRANSITION: MARCORSYSCOM